

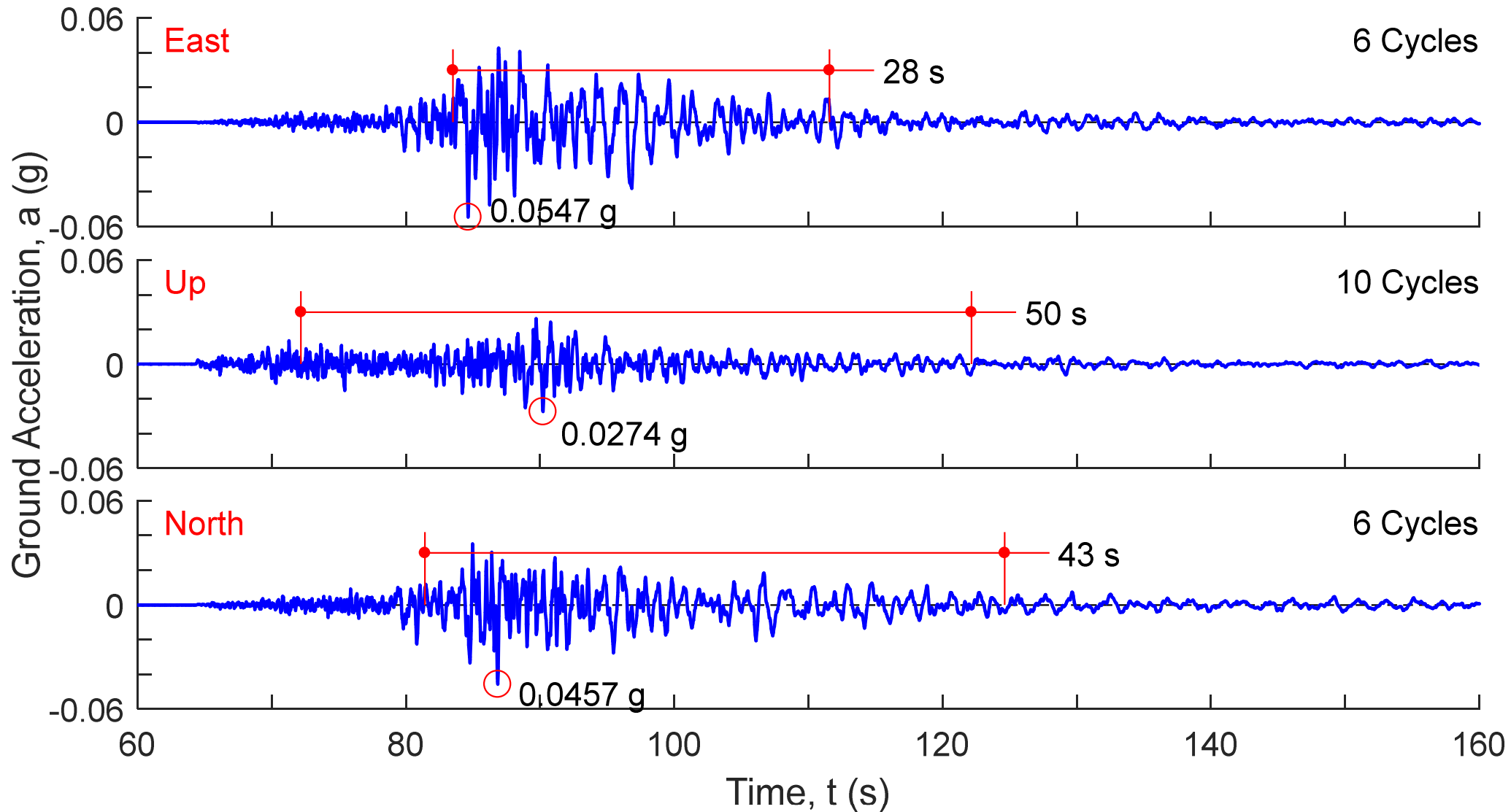
StrongMotions
Knowledge and Clarity **Inc.**

Ground Motion in Mexico City During **M 7.1 Earthquake of September 19, 2017**

Praveen K. Malhotra

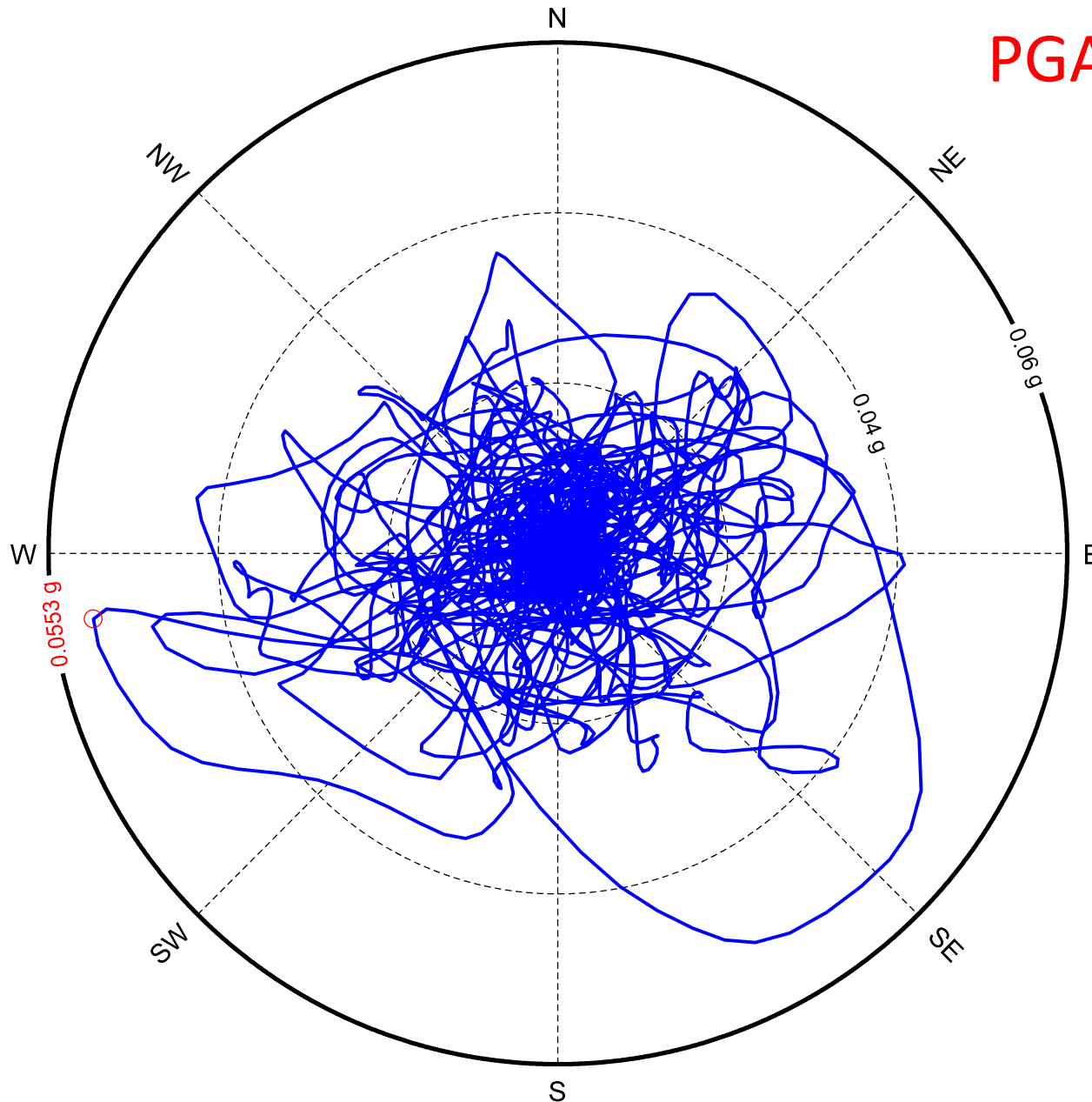
September 24, 2017

Ground Accelerations at UNAM Station in Mexico City (116 km from Epicenter)

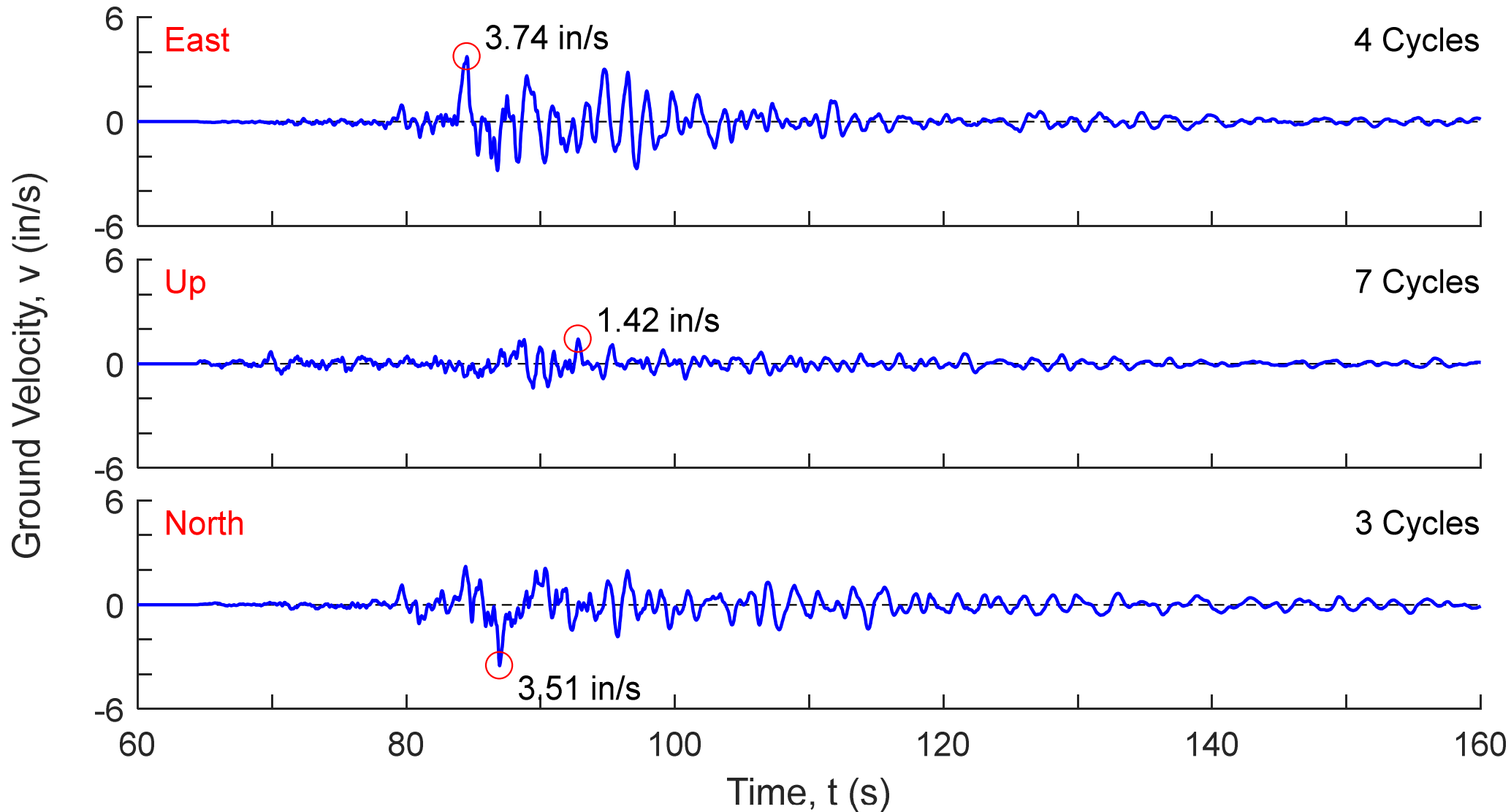


Resultant Horizontal Ground Accelerations at UNAM Station in Mexico City

PGA = 0.0553 g

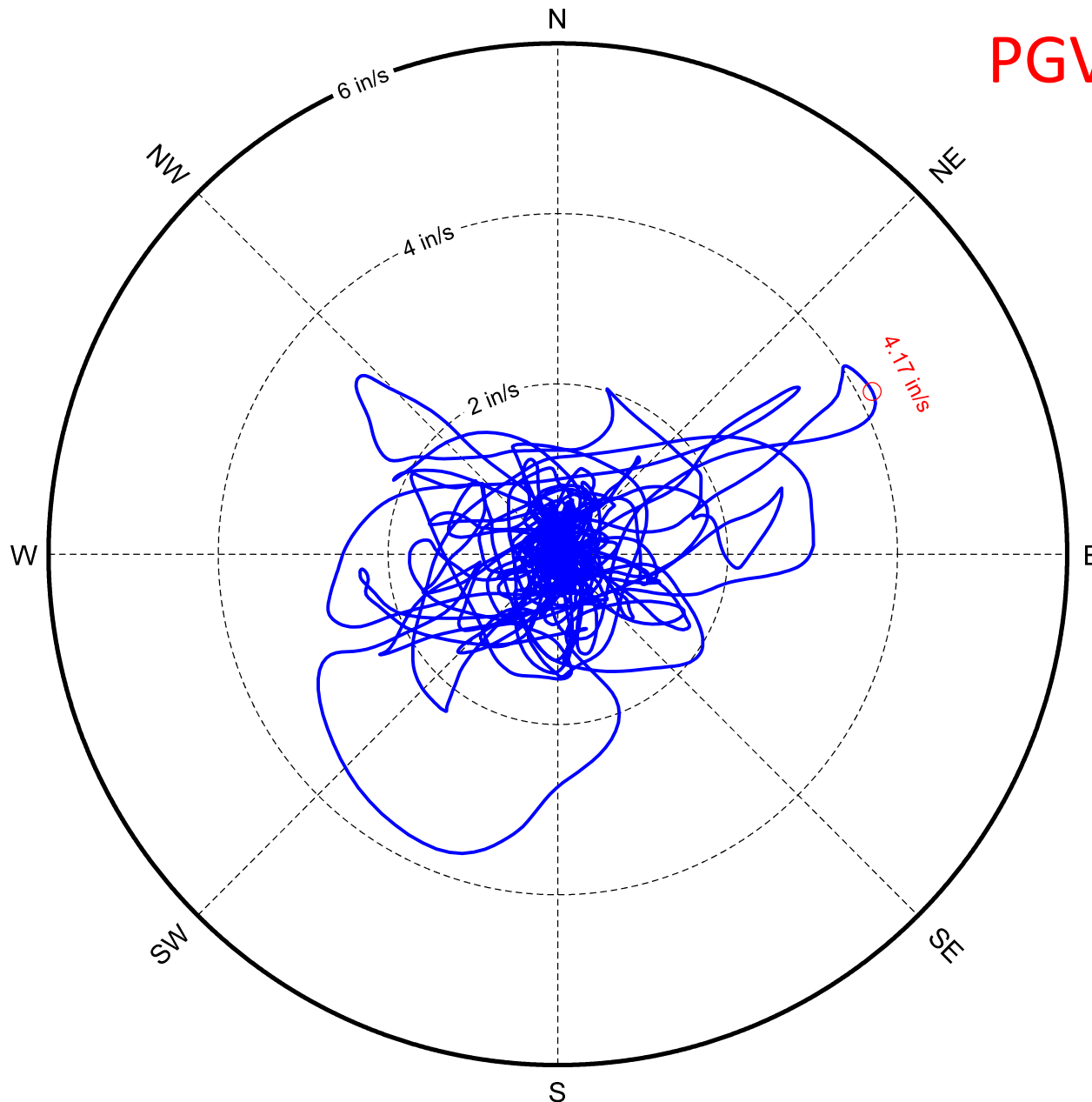


Ground Velocities at UNAM Station in Mexico City (116 km from Epicenter)

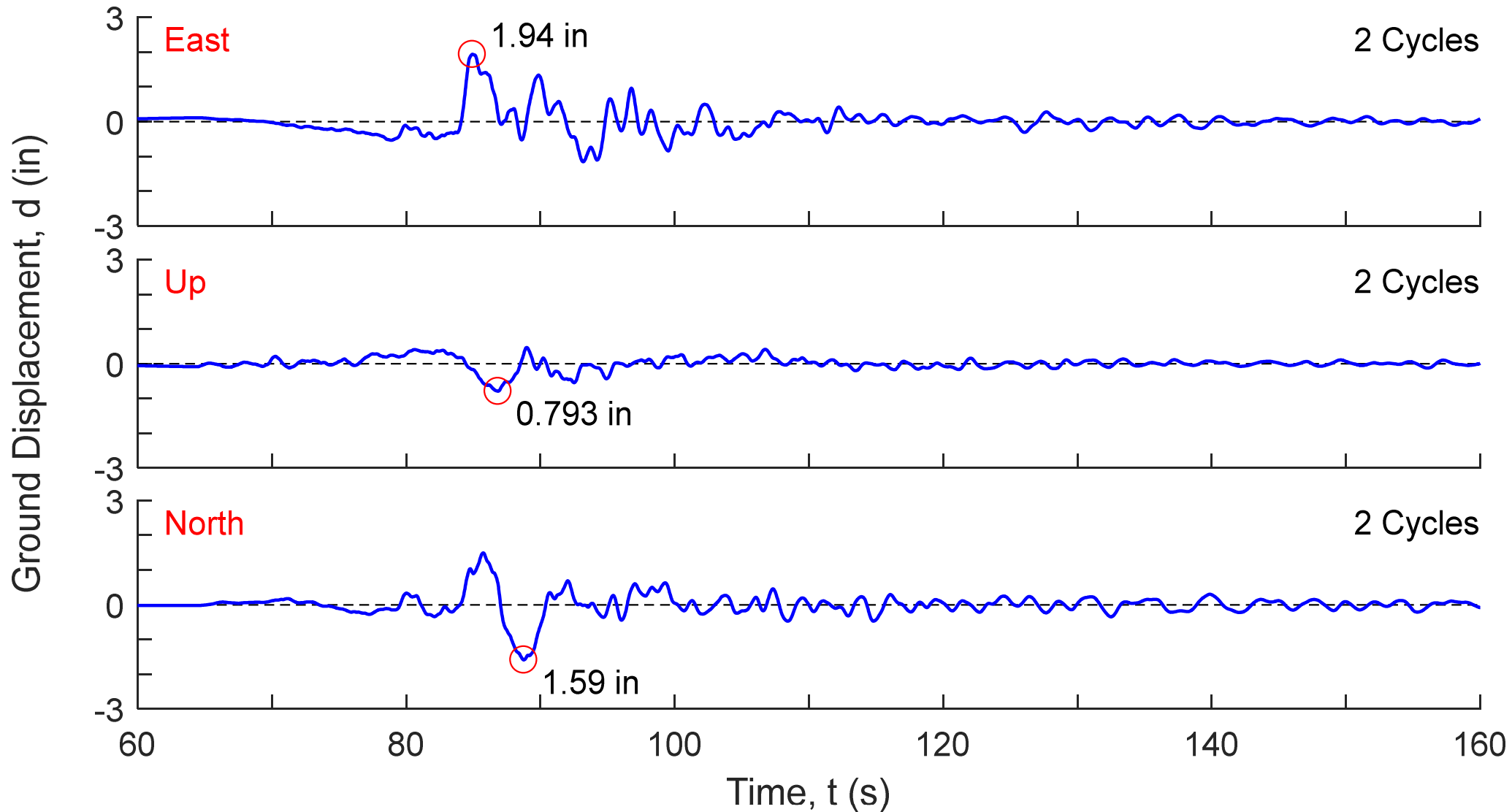


Resultant Horizontal Ground Velocities at UNAM Station in Mexico City

PGV = 4.17 in/s

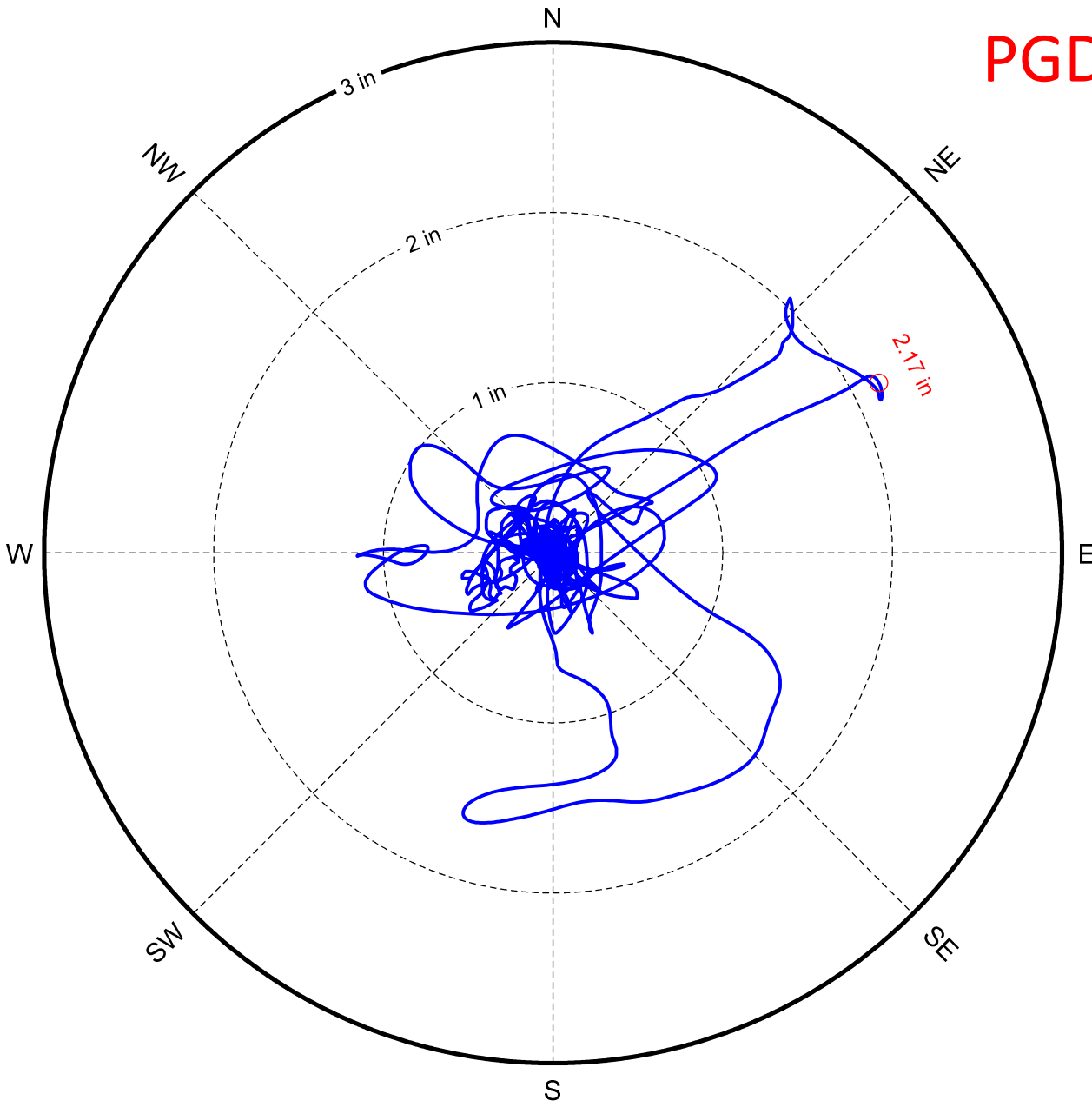


Ground Displacements at UNAM Station in Mexico City (116 km from Epicenter)



Resultant Horizontal Ground Displacements at UNAM Station in Mexico City

PGD = 2.17 in



Central-Period & Normalized-Velocity

- Central-period,

$$T_c = 2\pi (PGD/PGA)^{0.5} = 2 \text{ s}$$

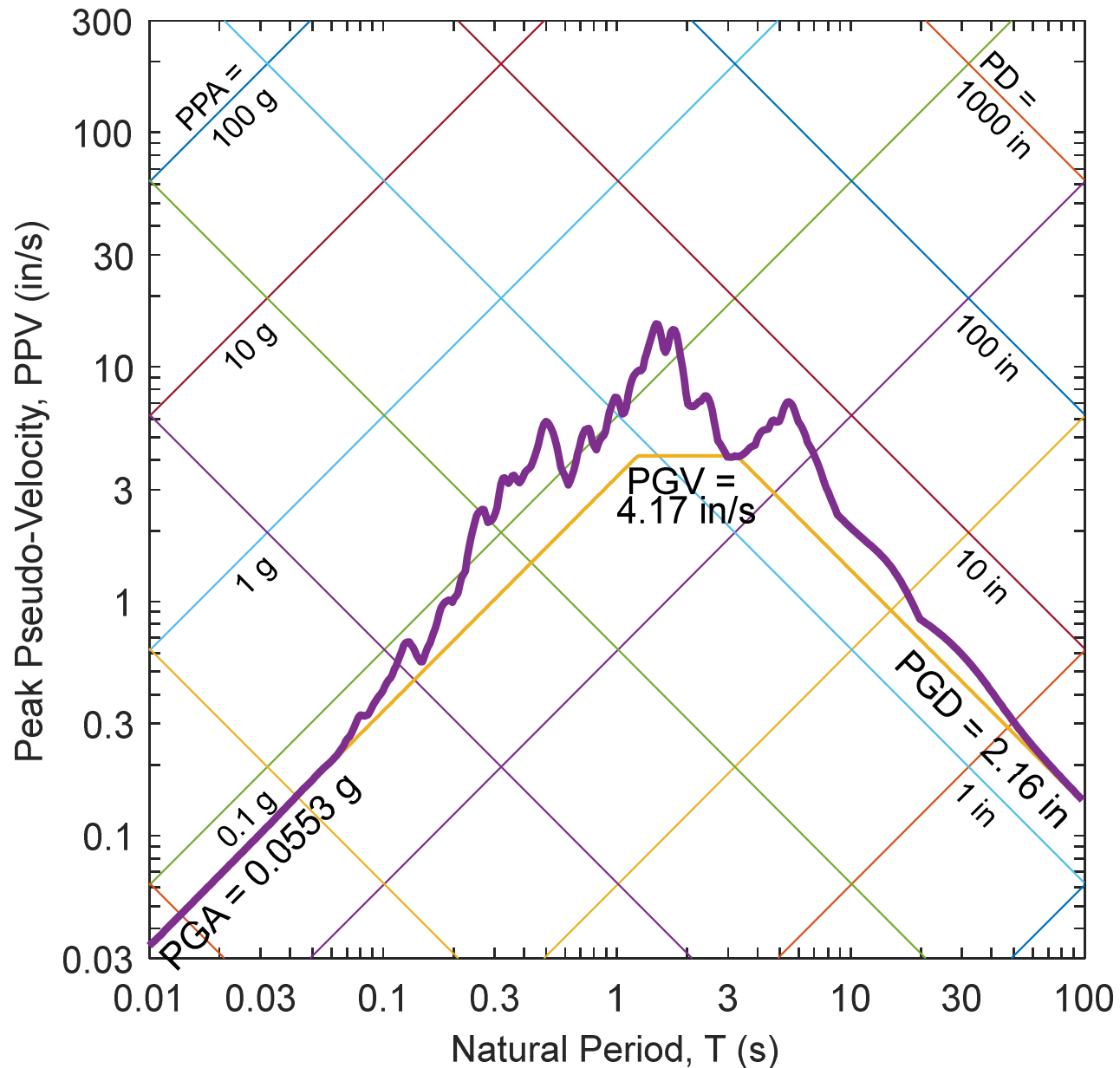
Hence, **low-frequency** ground motion

- Normalized-velocity,

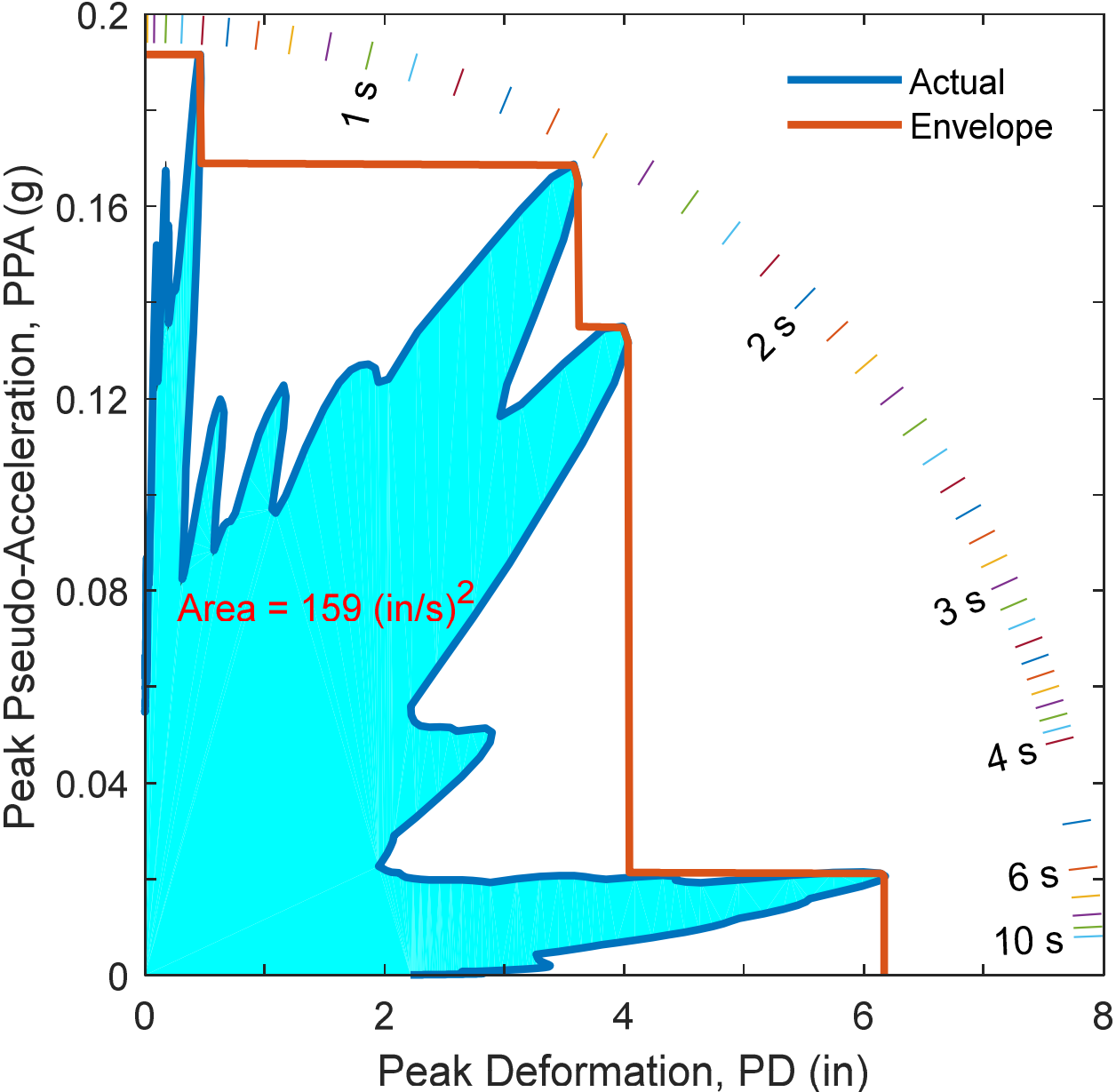
$$PGV_n = PGV/(PGD \cdot PGA)^{0.5} = 0.61$$

Hence, **medium-band** ground motion

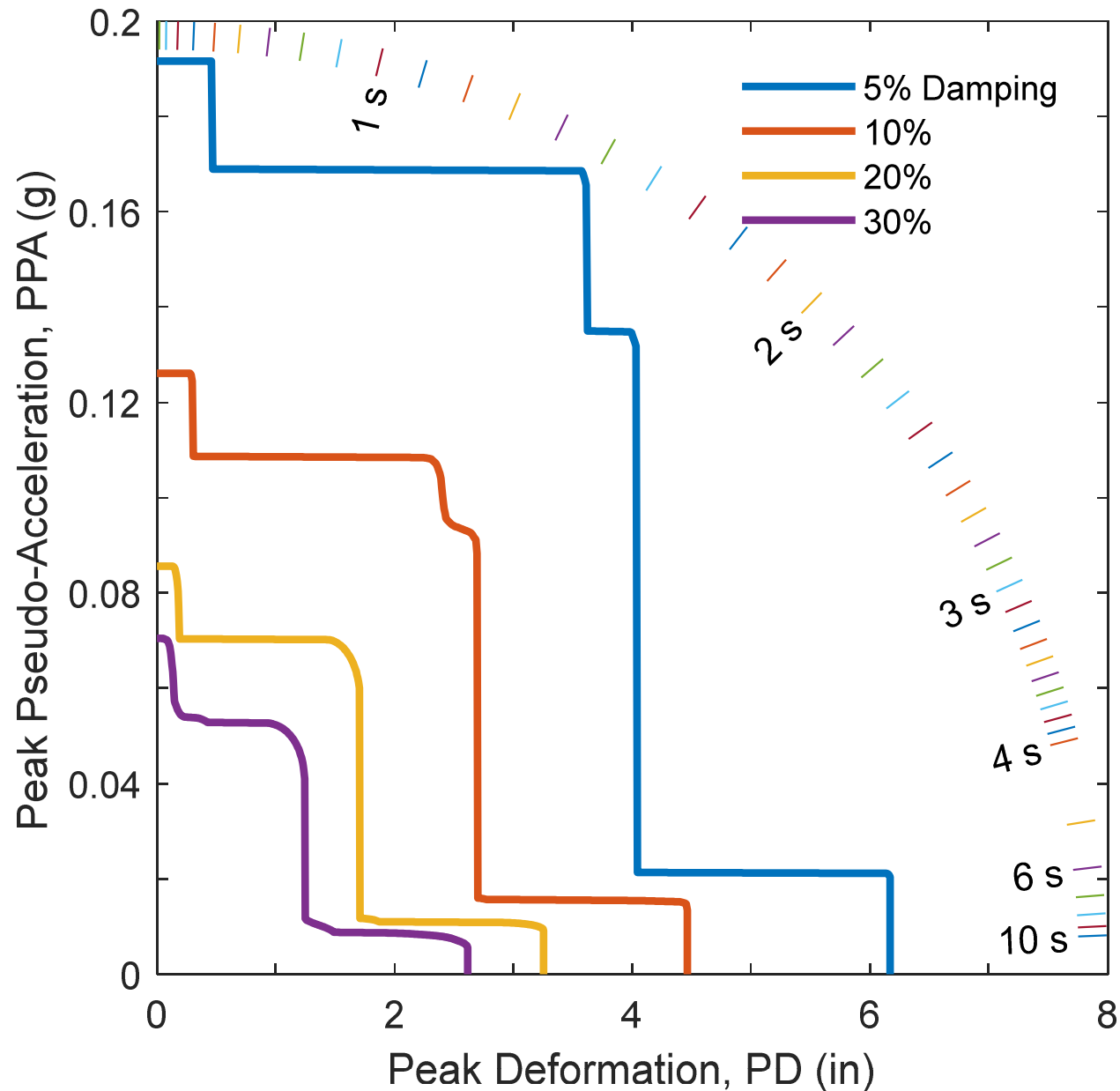
Tripartite Plot of 5% Damping Response Spectrum at UNAM Station in Mexico City



Acceleration-Deformation Plot of 5% Damping Response Spectrum



Envelope Response Spectra for Various Values of Damping



Deformation Demands on Structures of Various Lateral Strength and Damping

Lateral Strength (% of Weight)	Deformation Demand (in)			
	5%	10%	20%	30%
18%	0.5	—	—	—
15%	3.6	—	—	—
10%	4	2.4	—	—
8%	4	2.7	0.2	—
6%	4	2.7	1.7	0.1
4%	4	2.7	1.7	1.2

Observations and Comments

- Ground motion at UNAM station in Mexico City was low-frequency and medium-band
- Deformation demands were low on even weak structures
- Cyclic-demands were modest
- Such ground motions are not expected to collapse 'engineered' structures in seismically active regions

Acknowledgments

- Data may be downloaded from the **Center for Engineering Strong Motion Data:**
<http://www.strongmotioncenter.org/>
- Data processing, observations and comments are preliminary
- No warranty of any kind is assumed